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Status of available sulphur in cultivated soils of Mehsana district of Gujarat

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Abstract

The present study was carried out to determine the available sulphur status in soils of Mehsana district of Gujarat, three hundred and seventy one surface soil samples (0-15cm) were randomly collected from 10 talukas of Mehsana district of Gujarat. All the collected soil samples were analyzed for available sulphur as per standard procedures. The available S content in soils of Mehsana district varied from 5.50 to 49.31 mg kg⁻¹ with a mean value of 15.80 mg.kg⁻¹. Out of 371 soil samples of the district, 29.65, 49.87 and 20.49 per cent were found under low, medium and high category for available sulphur, respectively. According to the Nutrient Index Value (NIV) soils of Mehsana district were marginal in available S (1.91).

Keywords: available sulphur, nutrient index value, correlation

1. Introduction

Sulphur weaves the golden fabric of plant nutrition. Sulphur recognized as fourth important plant nutrient after N, P and K and is gaining considerable importance in quality crop production in context of Indian agriculture, particularly when there is more and more use of non-sulphur containing fertilizers as well as less use of organic manures. A few years ago, sulphur was considered as a nutrient of academic interest. But today its importance to Indian agriculture is being increasingly recognized [9]. In India, the total removal of S by growing crops is estimated to be 1.8 million tones per year and the addition of S through fertilizers is 0.8 million tones resulting in an annual deficit of 1.0 million tones [3]. Further, in intensive cropping systems, removal of S ranges from 30 to 70 kg per hectare per annum. Thus the annual S deficit could reach 1.3 million tones of S by 2010 unless extra ordinary corrective measures are taken to bridge the gap [3]. Thus, there is an urgent need for correction of sulphur deficiency and for arresting its further spread.

2. Analytical Methods

The total geographical area of Mehsana district is 4393 sq. km having 10 talukas (Fig 1). The study area is in between 23° 15' to 23° 53' N latitudes and 72° 07' to 72° 46' E longitudes with an elevation of 92-96 mt. above the mean sea level. The district has semi-arid and sub-tropical climate with hot and dry summer with an average rainfall of 625 mm. In general, the soils of the study are sandy loam in texture having poor moisture retention capacity. To assess available S and DTPA- extractable micronutrients (Fe, Mn, Zn, Cu) from soils of Mehsana district, three hundred and seventy one representative surface soil samples (0-15 cm) were collected from farmers' fields during summer season using multistage stratified random sampling method covering 10 talukas of Mehsana district of Gujarat. Determination of available S was done by extracting soil with 0.15% CaCl₂ [10] followed by turbidimetric method [1]. The soil samples were categorized into low, medium and high categories based on the critical limit of available sulphur [4]. The nutrient index values (NIV) for available sulphur and micronutrients were calculated utilizing the formula suggested by Ramamurthy and Bajaj (1969). Coefficient correlation (r) between soil properties (EC, pH and OC) and available sulphur were analyzed by statistical procedure as outlined by Panse and Sukhatme (1961) [5].

3. Result and Discussion

The available sulphur content in soils of Mehsana district varied from 5.50 to 49.31 mg kg⁻¹ with a mean value of 15.80 mg.kg⁻¹ (Table 1).

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Out of 371 soil samples of the district, 29.65, 49.87 and 20.49 per cent were found under low, medium and high categories for available sulphur, respectively (Table 1). Low status of available sulphur in (about 29%) soils would highly need sulphur management through addition of either inorganic S, organic manures or sulphonated compost and biocomposts or gypsum, sulphur - solubilising microbes. Sulphur deficiency also reported by Chouhan *et al.* (2012) [2] to the tune of 36.8% in Dewas district of Madhya Pradesh and 30% by Patel *et al.* (2012) [6] in Banaskantha district of Gujarat. Nutrient index value of Mehsana district ranged from 1.75-2.20 indicating

marginal to adequate fertility status of soil (Fig. 2). The soils of Mehsana district have overall NIV of 1.91 indicating marginal fertility status for available sulphur (Table 2). Available sulphur showed highly significant and positive correlation with organic carbon ($r=0.368^{**}$) whereas EC and pH do not show any significant relationship with available S (Table 3). This might be due to the fact that with increase in organic matter in soil, the clay-humus complex become more active thereby providing more exchange sites and access to sulphur.

Table 1: Talukawise range and mean values (mg kg^{-1}) with percent distribution in different categories of available S in soils of Mehsana district

Name of Taluka	Range (mg kg^{-1})	Mean (mg kg^{-1})	Percent Distribution		
			Low ($<10\text{mg kg}^{-1}$)	Medium ($10\text{-}20\text{ mg kg}^{-1}$)	High ($>20\text{mg kg}^{-1}$)
Becharaji	7.03-34.50	13.81	35.00	55.00	10.00
Kadi	6.29-40.60	18.29	20.00	52.50	27.50
Kheralu	5.55-29.20	14.75	37.50	42.50	20.00
Mehsana	6.29-49.31	17.17	34.04	38.30	27.66
Jotana	7.26-37.03	21.48	20.00	40.00	40.00
Vadnagar	5.63-29.24	14.87	33.33	50.00	16.67
Satlasana	5.72-30.56	12.86	35.48	45.16	19.35
Unjha	5.50-35.59	15.11	25.00	59.38	15.63
Vijapur	5.92-27.98	15.68	22.50	60.00	17.50
Visnagar	7.36-33.10	14.66	30.00	55.00	15.00
Overall	5.50-49.31	15.80	29.65	49.87	20.49

Table 2: Nutrient Index values and fertility status of available sulphur of Mehsana district

Name of Taluka	Nutrient Index Value	Fertility Status
Becharaji	1.75	Marginal
Kadi	2.08	Adequate
Kheralu	1.83	Marginal
Mehsana	1.94	Marginal
Jotana	2.20	Adequate
Vadnagar	1.83	Marginal
Satlasana	1.84	Marginal
Unjha	1.91	Marginal
Vijapur	1.95	Marginal
Visnagar	1.85	Marginal
District	1.91	Marginal

Table 3: Correlation coefficient (r) of soil properties (EC, pH and OC) with available sulphur

Available S	Soil Properties		
	EC	pH	OC
	-0.070	0.014	0.368**

* Significant at 5 % level of significance

** Significant at 1 % level of significance

4. Conclusions

Lack of knowledge and importance about sulphur among farmers, exhaustive and high yielding cultivars and neglected usage of farm yard manures seems to have terminated to a wide occurrence of sulphur deficiency [7]. It is obvious that the soil available S varied with variation in soil properties of different talukas of Mehsana district. It was observed that the soils of Mehsana district have marginal status of available sulphur indicating the need to supply sulphur fertilizer to meet sulphur requirement of crops.

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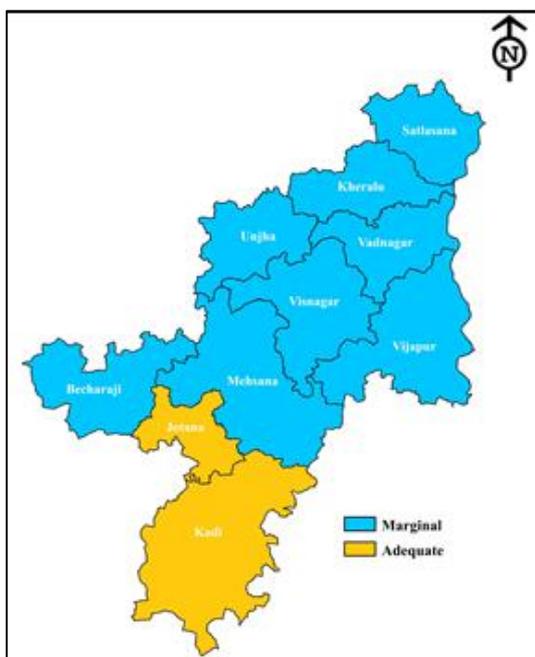


Fig 2: Available sulphur status in Mehsana district

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